

Application Number 10/652,672
Amendment dated October 1, 2007
Responsive to Office Action mailed June 29, 2007

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AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

Claim 1 (Currently Amended) A method comprising:
receiving a network access request and user information from a subscriber device;
authenticating the user information with an access concentrator of a network service
provider;
upon authenticating the user information, selecting one of a plurality of tunnel
termination devices based on weightings associated with each of the plurality of the tunnel
termination devices, wherein selecting the one of the plurality of tunnel termination devices is
performed prior to establishing any network tunnel with any of the plurality of tunnel termination
devices for terminating a subscriber session associated with the subscriber device; and
establishing a network tunnel with between the selected one of the plurality of tunnel
termination devices and the access concentrator.

Claim 2 (Currently Amended) The method of claim 1, further comprising calculating the
weightings based on a resource constraint associated with each of the plurality of the respective
tunnel termination devices.

Claim 3 (Currently Amended) The method of claim 2, wherein calculating the weightings
comprises calculating the weightings based on a maximum number of subscriber sessions
supported by each of the plurality of tunnel termination devices.

Claim 4 (Original) The method of claim 1, further comprising assigning the weightings to the
tunnel termination devices based on user input.

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Claim 5 (Currently Amended) The method of claim 1, wherein selecting a tunnel termination device comprises:

issuing a query to receive tunnel definitions associated with the user information received from the subscriber device, wherein the receiving tunnel definitions that associate each of the plurality of tunnel termination devices with preference levels;

selecting one of the preference levels;

identifying a subset of the plurality of tunnel termination devices associated with the selected one of the preference levels;

calculating the weightings for ~~the subset~~ each of the tunnel termination devices of the identified subset; and

selecting one of the plurality of tunnel termination devices of the identified subset based on the calculated weightings.

Claim 6 (Currently Amended) The method of claim 5, wherein calculating the weightings further comprises:

determining a maximum number of subscriber sessions supported by each of the plurality of tunnel termination devices of the identified subset; and

calculating the weighting associated with each of the plurality of tunnel termination devices of the subset as a function of the maximum number of subscriber sessions supported by each of the plurality of tunnel termination devices of the identified subset.

Claim 7 (Original) The method of claim 1, wherein establishing a network tunnel comprises establishing a network tunnel in accordance with the Layer Two Tunneling Protocol (L2TP).

Claim 8 (Original) The method of claim 1, wherein establishing a network tunnel comprises establishing one of a Multiprotocol Label Switching (MPLS) tunnel, a Generic Routing Encapsulation (GRE) tunnel, and an IP Security (IPSEC) tunnel.

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Claim 9 (Currently Amended) The method of claim 1, wherein establishing a network tunnel comprises establishing a network tunnel from an edge router to the selected one of the plurality of tunnel termination devices.

Claim 10 (Original) The method of claim 1,
wherein selecting one of a plurality of tunnel termination devices comprises selecting one of a plurality of Layer Two Tunneling Protocol (L2TP) Network Servers (LNSs) based on weightings associated with the LNSs, and
wherein establishing a network tunnel comprises establishing an L2TP tunnel with the selected one of the LNSs.

Claim 11 (Currently Amended) A method comprising:
establishing a communication session with a subscriber device;
selecting a set of tunnel termination devices from a plurality of tunnel termination devices based on a preference level;
calculating weightings associated with the tunnel terminations devices of the selected set based on a resource constraints for the respective tunnel termination device;
selecting one of the tunnel termination devices of the selected set based on the calculated weightings prior to establishing a network tunnel associated with the communication session with any of the plurality of the tunnel termination devices during the communication session; and
establishing a network tunnel with the selected one of the tunnel termination devices.

Claim 12 (Currently Amended) The method of claim 11, wherein calculating weightings comprises calculating respective weightings for the tunnel termination devices of the selected set as a function of a number of maximum subscriber sessions supported by each of the tunnel terminations devices of the selected set.

Claim 13 (Original) The method of claim 12, wherein calculating weightings comprises assigning the weightings to the tunnel termination devices based on user input.

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Claim 14 (Currently Amended) The method of claim 11, further comprising:
determining whether a preference level fail-over setting is enabled upon failing to establish the network tunnel with the selected one of the tunnel termination devices; and
selecting a second one of the tunnel termination devices from the set of tunnel termination devices when the preference level fail-over option is enabled.

Claim 15 (Original) The method of claim 14, further comprising:
updating the preference level upon failing to establish the network tunnel and when the preference level fail-over option is disabled;
selecting a second set of tunnel termination devices from the plurality of tunnel termination devices based on the updated preference level;
calculating weightings associated with each of the tunnel termination devices of the second set based on resource constraints for the respective tunnel termination device; and
selecting one of the tunnel termination devices of the second set based on the calculated weightings.

Claim 16 (Original) The method of claim 11, wherein establishing a network tunnel comprises establishing a network tunnel in accordance with the Layer Two Tunneling Protocol (L2TP).

Claim 17 (Original) The method of claim 11, wherein establishing a network tunnel comprises establishing one of a Multiprotocol Label Switching (MPLS) tunnel, a Generic Routing Encapsulation (GRE) tunnel, and an IP Security (IPSEC) tunnel.

Claim 18 (Currently Amended) The method of claim 11, wherein establishing a network tunnel comprises establishing a network tunnel from an edge router to the selected one of the tunnel termination devices.

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Claim 19 (Currently Amended) A network device comprising:

one or more processors;

a connection handler executed by the processors to receive network access requests and user information from subscriber devices;

a tunneling module executed by the processors to that load balance[[s]] subscriber sessions across a plurality of tunnel termination devices based on a resource constraint associated with the tunnel termination devices;

wherein, for each of the subscriber sessions, the tunneling module selects one of the plurality of tunnel termination devices prior to establishing a network tunnel with any of the plurality of the tunnel termination devices for terminating the subscriber session associated with the subscriber device.

Claim 20 (Original) The network device of claim 19, wherein the tunneling module load balances the subscriber sessions across the plurality of tunnel termination devices based on a maximum number of subscriber session supported by each of the tunnel termination devices.

Claim 21 (Currently Amended) The network device of claim 19, wherein the tunneling module assigns weightings to the plurality of tunnel terminations devices, and selects the one of the plurality of tunnel termination devices as a destination[[s]] for network tunnels in accordance with the assigned weightings.

Claim 22 (Currently Amended) The network device of claim 21 wherein the tunneling module calculates[[ing]] the weightings based on a maximum number of subscriber sessions supported by each of the plurality of tunnel termination devices.

Claim 23 (Currently Amended) The network device of claim 19, wherein the tunneling module assigns the weighting for each of the plurality of tunnel termination devices based on user input.

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Claim 24 (Currently Amended) The network device of claim 19, further comprising:
an authorization manager that generates data identifying the plurality of tunnel termination devices and associating the plurality of tunnel termination devices with subscriber preference levels,
wherein the tunneling module load balances the subscriber sessions across the plurality of tunnel termination devices in accordance with the associated subscriber preference levels.

Claim 25 (Currently Amended) The network device of claim ~~24~~ 19, wherein the tunneling module identifies a subset of the plurality of tunnel termination devices associated with a current one of the subscriber preference levels, calculates the weightings for each ~~the subset~~ of the tunnel termination devices of the identified subset, and selects one of the tunnel termination devices of the identified subset based on the calculated weightings.

Claim 26 (Original) The network device of claim 19, wherein the tunneling module establishes network tunnels with the tunnel termination devices in accordance with the Layer Two Tunneling Protocol (L2TP).

Claim 27 (Original) The network device of claim 19, wherein the tunneling module establishes network tunnels with the tunnel termination devices in accordance with one of the Multiprotocol Label Switching (MPLS) protocol, the Generic Routing Encapsulation (GRE) protocol, and the IP Security (IPSEC) protocol.

Claim 28 (Currently Amended) The network device of claim 19, wherein the network device comprises an edge router, and ~~the a~~ tunneling protocol establishes network tunnels from the edge router to the plurality of tunnel termination devices.

Claim 29 (Original) The network device of claim 19, wherein the network device comprises a Layer Two Tunneling Protocol (L2TP) Access Concentrator (LAC), and the tunnel termination devices comprise L2TP Network Servers (LNSs).

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Claim 30 (Currently Amended) A computer-readable storage medium comprising instructions to cause a processor to:

receive a network access request and user information from a subscriber device;

select one of a plurality of tunnel termination devices based on weightings associated with each of the plurality of tunnel termination devices, wherein selection of the one of the plurality of tunnel termination devices is performed prior to establishing a network tunnel with any of the plurality of tunnel termination devices for terminating a subscriber session associated with the subscriber device; and

establish a network tunnel with between the access concentrator and the selected one of the tunnel termination devices.

Claim 31 (Currently Amended) The computer-readable medium of claim 30, further comprising instructions to cause the processor to calculate the weightings for each of the plurality of tunnel termination devices based on resource constraints associated with the tunnel termination devices.

Claim 32 (Original) The computer-readable medium of claim 31, further comprising instructions to cause the processor to calculate the weightings for the tunnel termination devices based on a maximum number of subscriber sessions supported by each of the tunnel termination devices.

Claim 33 (Currently Amended) The computer-readable medium of claim 30, further comprising instructions to cause the processor to assign the weighting for each of the plurality of tunnel termination devices based on user input.

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Claim 34 (Currently Amended) The computer-readable medium of claim 30, further comprising instructions to cause the processor to:

receive tunnel definitions that associate the plurality of tunnel termination devices with preference levels;

select one of the preference levels;

identify a subset of the plurality of tunnel termination devices associated with the selected one of the preference levels;

calculate the weightings for ~~the subset~~ each of the tunnel termination devices of the identified subset; and

select one of the tunnel termination devices of the subset based on the calculated weightings.

Claim 35 (Currently Amended) The computer-readable medium of claim 34, further comprising instructions to cause the processor to:

determine a maximum number of subscriber sessions supported by each of the tunnel termination devices of the subset; and

calculate the weighting associated with each of the tunnel termination devices of the identified subset as a function of the maximum number of subscriber sessions supported by each of the tunnel termination devices of the identified subset.

Claim 36 (Original) The computer-readable medium of claim 30, wherein the instructions cause the processor to establish a network tunnel in accordance with the Layer Two Tunneling Protocol (L2TP).

Claim 37 (Original) The computer-readable medium of claim 30, further wherein the instructions cause the processor to establish one of a Multiprotocol Label Switching (MPLS) tunnel, a Generic Routing Encapsulation (GRE) tunnel, and an IP Security (IPSEC) tunnel.

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Claim 38 (Currently Amended) The computer-readable medium of claim 30, wherein the instructions cause the processor to establish a network tunnel from an edge router to the selected one of the tunnel termination devices.

Claim 39 (Currently Amended) A system comprising:
a subscriber device; and
an Internet Service Provider (ISP) comprising:
a Layer Two Tunneling Protocol (L2TP) Access Concentrator (LAC), and
a plurality of L2TP Network Servers (LNSs),
wherein the LAC applies a weighted load-balancing process to select one of the LNSs and establish an L2TP tunnel associated with the subscriber device with the selected one of the LNSs, prior to establishing any L2TP tunnel with any of the plurality of the LNSs for terminating a subscriber session associated with the subscriber device.

Claim 40 (Currently Amended) The system of claim 39, wherein the LAC applies the weighted load-balancing process by calculating weightings for each of the plurality of the LNSs based on resource constraints associated with each of the plurality of LNSs.

Claim 41 (Currently Amended) The system of claim 40, wherein the LAC calculates the weightings based on a maximum number of subscriber sessions supported by each of the plurality of LNSs.

Claim 42 (Currently Amended) The system of claim 39, wherein the LAC applies the weighted load-balancing process by assigning weightings to each of the plurality of the LNSs based on user input.